

*With the Compliments of
Prof. Bache*

ANNIVERSARY ADDRESS

BEFORE THE

AMERICAN INSTITUTE,

Of the City of New-York,

AT THE

TABERNACLE,

October 28th, 1856,

DURING THE

Twenty-Eighth Annual Fair,

BY

PROF. A. D. BACHE,

SUPERINTENDENT OF THE U. S. COAST SURVEY.

NEW-YORK:

PUDNEY & RUSSELL, PRINTERS,

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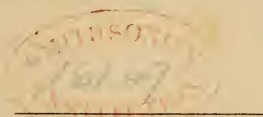
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A D D R E S S .

MR. PRESIDENT, LADIES, AND GENTLEMEN :—

IF mind produces material improvement, this reacts equally upon mental progress. Society as it exists comes, humanly speaking, out of these actions and reactions. The state of society in our country at this day is modified by communication by telegraph ; by easy personal communication by steam ; by facilities for transportation by steam, and wind, and life, which determine the conditions of commerce and navigation,—commerce internal and external. For all practical purposes of communication between man and man, the large area of our country is but as one of the former States of our Confederation. The Postmaster-General of the Confederation travelling on his way from Boston to Philadelphia, and making it a point to stop at the good inn of Tower Hill, Rhode Island, on his ten days' journey, is typical of that day of small and slow things. He, of the United States, is carried through the same country by the railway, avoiding "Tower Hill," and making no pauses in his way by land and wa-

ter in a journey of sixteen hours ; or, if he prefer land, in twelve hours of travel. Days have thus nearly shrunk into hours. Five days and a half carry one to the far West, near the limits of our interior civilization, reached with months of toil by Lewis and Clark, and by Pike and Long, not fifty years ago. The improvement in dwellings, in dress, in food ; the appliances for comfort, for luxury, for knowledge—how great. Compare the Fifth Avenue palace, with its comforts of gas, and warm air, and water ; its splendid exterior and interior ; its spacious parlors, and chambers, and offices ; its inlaid floors, its polished doors, its stained or plate glass windows, and their gorgeous curtains ; its frescoed ceilings and walls. Compare these with the front of chequered black and red brick of sixty years ago, the contracted parlor, and the small, illy-ventilated chamber, the “watery dip” candle, and the wide open fire-place, the rough floors coarsely carpeted, the small doors painted ; the windows with nine by six glass, full of veins and streaks, and distorting everything seen through them ; the prim blinds, white-washed ceiling, and clumsily papered walls stained with paste. Life in these dwellings must have its features as characteristic as the dwellings themselves. The arts and sciences thus mould society. Mind is indebted to them for its facility of acting upon mind, and literature pays its tribute, which it returns with interest to the arts.

Through all these changes in the face of society, it would be curious to follow, if we could, the thread which runs through the same families, the same portions of a country, the same races of men. The omniscient eye takes all this in at a glance, and sees how peculiar traits descend from

father to child, and are modified as they pass; how particular characteristics stick to the same localities; how they typify particular races of men. How the descendants of those who resisted tyrants in the olden times are friends of popular rights to-day; how those of the bold warrior of former ages now make the enterprising navigator or merchant. How the Cavaliers and Round-heads of the past re-appear in the gayeties and gravities of modern times. How those races who persecuted, for opinion's sake, with sword and stake, now persecute with tongue and pen. New conditions are enforced by public opinion; but the world is not all free to-day, even in countries of free governments.

Masses of men have their aggregate character, and, as climate is inferred from means of varying temperatures, so may an average typify men in the aggregate. As we may describe climate by its extremes, or by striking peculiarities, or by average indications—so men.

The wants of society express themselves in the institutions which society creates, though those wants may exist long before they are supplied. Christianity was a necessary preparation for the establishments of public charities, the asylums for the destitute and the unfortunate, the halt, the maimed, and the blind, though this want existed before the Gospel was preached to the poor.

It may not employ us unprofitably during the brief time allotted to this address, to consider some of the institutions connected with the wants of our country and of our day; and especially at the close of the Annual Fair for the exhibi-

tion of products of the arts and manufactures, to examine some of those devoted to the progress of the arts and sciences.

In this discussion I must necessarily limit myself to those establishments which are generic. After noticing the classes of institutions which are devoted to the education of youth, I shall pass to those for adult education or improvement, and for the improvement of the arts and sciences themselves, such as the American Institute, and the Franklin Institute of Philadelphia, as the types of this class of mechanical institutions, and shall notice the modes adopted by them for progress. The wants which they represent are, mutual improvement by the members, and advancement in the arts and sciences. Next, commerce will claim our attention, and the doings of the Chamber of Commerce of New-York will serve us as text. The great library of the merchant prince, John Jacob Astor, and the Union of that most excellent of men, Peter Cooper, will also be noticed. From these efforts already made, I shall pass to the examination of what I consider the great want of the day, yet unsatisfied—a University of the Arts and Sciences.

You may consider this address as a nook, or a very small corner of the Crystal Palace Exhibition. These institutions are so many frames upon which I intend to hang the objects to be exhibited to you. The frames themselves, like those of the great glass house, shall be put together according to general mechanical principles, and the articles shall be so arranged as not to strike you as “confusion worse confounded ;” but the smaller ones, and the pegs on which they hang,

may be stuck about in some little disorder, and even some of the wares may be pinned on loosely, for the hours of preparation have been few and short.

In the United States almost everything is done on the voluntary plan. It has produced splendid results, but results wanting, of course, in system. When new Berlin was built, whole streets of buildings upon the same general plan arose, and the palace was set off by the plainer dwelling, the effects of massive uniformity and the more pleasing ones of variety being all studied according to a general design. The materials of the individual buildings were not of a costly sort. With us brown stone, granite, and marble, and costly pressed bricks, and highly ornamented iron, are gathered together, and, without order or method, each one builds one, two or more structures as he lists, and the effect of the whole is poor, and even sometimes repulsive. Many of our separate institutions are admirable in their way, but what a heterogeneous mass they form. Each of them expresses a want of the community, for unless they are wanted they die out—but there is no more method in them than in the grouping of the Broadway houses. I know that it is supposed by some that, as a crowd in which each one attends to his own business is for many purposes of society as effective as one directed by police officers, so these self-directed institutions, separately organized, may be as good as a systematic arrangement of establishments. No one, however, who reflects deeply upon this proposition, divested of the figure, will, I think, come to such a conclusion. Figures are sometimes admirable as illustrations, but they are not arguments.

I was present at a keen encounter of wits between an officer connected with one of the Executive Departments of the Government, who had prepared a report which was to be printed, and a gentleman connected with the public printing. The officer who had prepared the report desired to superintend its printing. The other desired that it should take its place with other matter for public printing. Why, said the latter, it is like the contrast between carrying on a wholesale and retail business—it stands to reason that the wholesale way is cheapest, and from the division of labor the best. I regard it, rather (said the other) as like the difference between rearing a child born to one, under the parent's eye, in the family, until he is prepared for the world, and the handing him over to an asylum to be dealt with as one of many bantlings, and so be introduced into society. Now the report was neither a piece of cotton nor linen, nor a bantling of flesh and blood and mind. The figures could both be pictured, and therefore, according to Blair, were good figures—but neither of them proved anything.

Let us, now, for awhile, study some of the prominent institutions of education and improvement in science and the arts, and consider the wants of which they are the exponents.

SCHOOLS, ACADEMIES, COLLEGES.

At the basis of the whole,—sunk deep in the national soil,—below, as I doubt not, the reach of every frost,—are the Common Schools, common to all as a rule. Neglected in some parts of our country, and worthy of the

other sense of the word common, but generally appreciated, and, having employed some of the best minds in their organization and advancement—I feel a profound conviction that no substitute for these schools, adapted to the wants of society in the United States, can be found, and that they should be fostered and improved until they supersede all other establishments of their grade. Neither private education, nor that by associations, either religious or charitable, can také the place of general public education. Where the public schools are not as good as the private ones, these institutions have not supplied the want of which they are the index, and require further development. The public schools should be the best schools—the training in them the most thorough that can be had anywhere.

Above these schools, adapted to a different age, comes the Academy, or High School, or College. Over a large portion of the country, these institutions, representing the want of a culture of a higher grade, and addressed to a more advanced age than the Common Schools, have no connection with the former. In some parts, I fear, there is almost antagonism in their positions. When this is so, will not the good and patriotic seek to devise a remedy for so unhappy a state of things? As the rivers are fed by the streams from the mountain-side, or the hill-side, or the gently sloping plain, collecting the drainage of the whole land, so should these institutions be fed by pupils from all the Common Schools. Where this has been effectively realized, as in this city, in Philadelphia, and, in a great degree, in Boston, the result has been of the best

character—best for the public schools, which are vivified by the Free Academy, or the High School—and best for the youth of these cities. That a connection of other existing institutions, of the same grade, with this great public system, would be a benefit to them and to it, I feel entirely convinced: and one day this truth will be recognized. I had hoped its earlier recognition.

It is actually a conservative principle in society, organized like ours, to let men do, as far as possible, as they desire in a right career; waiting for the development of public opinion to change public action. Impatience produces volcanic outbursts which shake institutions and society, disturbing individual and aggregate relations. When society is organized upon the actual and avowed basis that any man may wield the degree of influence and power to which his qualities entitle him, it is conservative to afford to every one the easiest route to his position. Obstacles only irritate, and repression renders talent dangerous.

It seems, in looking over these institutions of learning adapted to the young, that even in their present condition, and especially with the means of improvement which they contain within themselves, and with the pressure of public opinion upon them, they really furnish the greatest part of the facilities required for the education of youth. Their shortcomings, if any, are not lightly to be blamed. Their improvement has been very great within the last thirty years, measured by the standard of each institution, by their condition with respect to each other, by the

general condition of education. This is true, I know, in regard to scientific culture, the only portion in reference to which I undertake to judge; to mathematics and physics, as far as they have place in a college course. The influences which have produced this, it is not my design to attempt to trace; but I must be allowed to say, in passing, that our National School at West Point has, by thorough training of its graduates in a course of exact science, caused a reaction upon the Colleges quite as useful in its results, as the direct influence of the institution in its more limited sphere. It has also, by its action on the popular will, raised up for itself a competitor in the Naval Academy, which will, in time, vie with the elder institution in its good work.

The youth of our country, in their impatience for entering life, have, no doubt, diminished too much the period of preparation for it by study, and their parents have, in a degree, conspired with them in their demands for railroad speed in the College course, diminishing, especially in certain portions of the country, the age of matriculation and graduation, and therefore necessarily lowering the grade of Collegiate instruction. But, after all, there has been great improvement in these institutions. Minds of high grade, thoroughly trained, are connected with them, and earnest zeal and exalted talent are devoted to their improvement. Our Colleges have done well in the past, they will do better in the future.

In this country our ambition led us at an early day to endeavor to imitate or even rival the Old World insti-

tutions, and before the way was fairly open by education, we proceeded to the establishment of Colleges and Universities. We thus followed the examples of the philosophers of Laputa, who, according to Dean Swift, began the erection of their houses *at the roof*. The Colleges, however, it must be admitted, helped to invigorate the schools below them.

The organization of Universities in the early colonial days was like the construction of those enormous hotels in the West, rivalling the St. Nicholas and Metropolitan of Broadway, while the land was scarcely cleared. But Chicago has grown up to its hotel, and others are required upon even a larger scale. And the country has grown up to its early organization and has passed it. Good Bishop White, of Pennsylvania, used to relate with great pleasure the meetings of the Trustees of the College of Philadelphia by the bedside of the venerable Franklin, and the quaint ways which he took to convince them that they wanted an Academy where the English branches should be foremost, and not a College for classical instruction. He traced in turn the theory of different parts of wearing apparel, how the rim of the hat, now in its narrowness, a useless appendage, had once been the visor of the helmet; —the cuff of the coat, the band of the gauntlet. Now we have, in a great degree, ceased to discuss such matters. We want all sorts of knowledge which can train the intellect, the more the better, and the craving grows with what it feeds on instead of becoming sated. We have classes of persons who are desirous of entering life fully armed by all the learning for the struggle, and large

classes who, having entered life, are anxious to grow in mind as they advance in age, and who seek the outlets of knowledge with persevering spirit. How many institutions owe their origin to this spirit! Does it not pervade the one in connection with which we are now assembled? Witness its lectures, its publications, its exhibitions.

UNIVERSITIES.

Coming, then, from the period of youthful training, we enter the University, that great finishing institution for life. Where is our American University? We find schools of law, of medicine, of theology, scattered over the United States,—do not these constitute in fact, if not in name, a great University? Because scattered, do they lose their character? Would they acquire it merely by their union? Would not attaching, as in the German organization, to combined schools of law, medicine, and theology, a faculty of philosophy, thus constitute each and every one a University? All these questions are worth discussing. But this is not the time nor the place to do so, nor is it necessary to my present purpose. If I intended to throw stones (which I do not) it would not be at this, the close of an exhibition held in a *glass house*, that I would do it. These schools express the several wants of the time and country for special professional education, and fulfil, in a greater or less degree, their mission. The professions will see that they advance.

MECHANICS' INSTITUTES.

In Philadelphia, some thirty-five years ago, a few mechanics met to consult upon an institution for mutual improvement. A similar movement had been commenced by other parties, and from their united efforts sprang the Franklin Institute of Pennsylvania for the Promotion of the Mechanic Arts, of which James Ronaldson, the Philadelphia Type Founder, was the first President.

In 1791 a few patriotic men, such as R. R. Livingston, Mitchell, Kent, Dewitt, Jay, and others, founded in New-York a society for the advancement of agriculture, arts, and manufactures. This was in operation for but ten years, and at the close of its incorporation expired.

The American Institute originated twenty-eight years ago, in the far-sighted efforts of a few individuals, among the most active of whom were the late Secretary, Thaddeus B. Wakeman, and the present Secretary, Hon. Henry Meigs, and many of the founders have lived to see their bantling grown to manhood. The officers, committees, and clubs of the institution are ever active in the affairs of agriculture, commerce, manufactures, and the arts, to promote which they were incorporated. The annual volume of transactions, published with commendable liberality by the State of New-York, contains, besides the report of the progress of the institution itself, those of the judges of the Fair, of the committees of Arts and Sciences, addresses, and useful papers on subjects within the wide scope of the Institute.

The members are, to use nearly the language of the venerable Secretary, the kind of men by which republics can be made and maintained—making and maintaining themselves, they always have surplus power to maintain the State.

The wants here represented were intellectual improvement of the cultivators of the mechanic arts, and improvement of the arts themselves.

The Franklin Institute was, in part, for the education of youth and adults, in part, for the advancement of the arts. Regular courses of lectures on Natural Philosophy and Chemistry, and their application to the arts, mining and metallurgy, geology, and occasional courses in various branches of science and art; schools for mathematics, for architectural, mechanical, and miscellaneous drawing fulfilled the first object. The second was reached by means of exhibitions. The first exhibition of the Franklin Institute was held in the Carpenter's Hall in 1827, the last overflowed the largest building which the city of Philadelphia could furnish to it.

CRYSTAL PALACE.

The first New-York exhibition under the auspices of the American Institute was held in 1853, in the contracted space of the Masonic Hall; that of 1856 occupies the building of the World's Fair of 1853.

The idea of filling the Crystal Palace with articles of domestic manufacture, would two years ago have seemed,

perhaps it did seem when first suggested, almost preposterous. When we recollect that fears were entertained, whether the products of the Industry of all Nations would be sent in sufficient quantity to fill those vast floors, we can appreciate the boldness of the idea which would seek such an area for the display of American fabrics. And yet this space is by no means a void. Where else could the ample proportions of those steam engines find their appropriate place? or those products of the boat-builder's skill, or those exquisite fabrics from Lawrence, or those useful ones from Manchester? Where else could those planing machines and turning lathes, those atmospheric hammers, those machines for pumping and draining, for transmitting power, for splitting wood, for dressing stone, for warming, ventilating, cooking; in short, for all the varied purposes of the arts and of life—be exhibited and in action, with room and verge enough to pass around and between, to admire and to examine? Then, where else could the marriage of the mechanic arts and the fine arts (that happy thought) have found space for its celebration, but here!

Modern machines seem not only instinct with life, but to have *thought*—so perfectly do they supply those movements which, directed by law, are usually the results of thought and will. In the old printing press, ink was applied to the types by hand by huge stuffed leather balls; the paper was cut to its size and placed upon the press by hand, and by hand folded down upon the types—other hands passed the whole under a screw or toggle-joint, which, by an independent exercise of will, was

brought down upon the types; the paper was then released, removed and folded:—several hands directed by thought were thus at work. Now, the paper is cut from the roll, and in some cases is actually manufactured from the rags, and presents itself to be cut, the types are inked, the impressions made, all by mechanical power, one man controlling the whole; and in the machine, fingers remove the printed paper from the press and fold it—they seem absolutely to be thought directed. I saw a small specimen of “Young America” watching, puzzled, this most ingenious operation. It must think, (his face seemed to say!) At last, the roll of paper giving out, the fingers came forth to seize nothing, and the lad laughed aloud at their stupid clutching at vacancy. He had, at last, caught the idea of this thinking machine!

Modern civilization rendered such a structure as the Crystal Palace practicable. It was, as has been justly remarked of the great London prototype, as much a piece of mechanism as any machine within it—its parts separately wrought out from model and drawing, and put together with system, plan and order. The chief material, glass, was but little known to the ancients, and less used; and the idea of constructing a palace of such a fragile material comes only in a time of peace, of law and order, and of civilization. The moral effect of such a structure is not to be lost sight of.

Noticing the progress of public opinion in regard to the preservation of public objects of art and nature, Mr. Babbage, speaking of the introduction of water-fowl into the parks of London, says:—

“In former days if there had been water-fowl in our parks, some such notice as this would have been placarded :—‘Whoever throws stones at or frightens these birds, shall be prosecuted with the utmost severity of the law.’ In the present day we read the much more effective address—‘These birds are recommended to the protection of the public.’ The advantage of action upon this principle is not confined merely to its direct efficacy for its purpose. A still more important benefit remains latent—one which never ought to be lost sight of in the administration of laws. It enlists public opinion in favor of law and order.”

Prior to 1837, the British Museum was open to admission only by tickets; and it was contended, that to open it to indiscriminate entry, would expose the collections to injury and loss. The experiment was tried of throwing it completely open during the Easter holidays; when it was thronged to inconvenience; and yet nothing was taken, and only a pane of glass accidentally broken by the crush in the narrow part of a passage.

Not the least wondrous of the sights of this American Crystal Palace, are the moving groups which throng its long-drawn aisles. Not, as in the Wall-street part of Broadway, where carking care shows on every face, and the fixed look, the wrinkled brow, the impatient gesture, indicate that care goads the passenger as he drives along; but where the faces are lit up with inquisitiveness, with the genial flow of gratified curiosity, or the grave but satisfied air of examination and investigation. See that school, headed by the sympathizing teachers, asking, hearing, moving, here and there in files, in knots, in little groups, in large fronted columns! See how the girls and boys display the different tempera-

ments and trainings of the sexes! See the different objects which attract their gaze and elicit interest! What a beautiful effect, those graceful forms and brilliant dresses sprinkling the floor and mixing with the sober gloom of the iron machinery, and how those graver costumes contrast with the bright hues of the dahlias and brilliant exotics!

A few in lightness, easily forgiven—a few in talk of things not of the exhibition, perhaps of mechanics, not of machines. These are the exceptions to the groups, and are balanced by those solemn faces which discuss apart to the very minutest detail, that new invention, and by those busy men who are dilating on the merits of the machines which have cost them nights of sleeplessness and days of toil. May the world appreciate their labors, and reward them with better things than that “hope deferred which maketh the heart sick.”

What if these breasts were made of glass?—not roughened like that of our Palace to keep the outsider from looking in, but good transparent crystal. Then, our illusion would vanish, and the inside show come back to the Broadway type. Let us rather use the scene as not abusing it; admit the light of day, but give no transparency. Let us enjoy our Crystal Palace illusion while it lasts. Let us believe that, in this house, at least, there is no skeleton.

I have often wondered that more care was not taken amongst us to preserve the statistics of different enterprises, with a view to know their actual results, and trace them

to their causes ; and, further, with a view to their practical utility. If a railroad is organized in a city, for example, the statistics of the number of passengers at different times in the day, on different days, on different occasions, should be carefully collected and mapped in curves so as to show the results to the eye. It would then be seen how the wants of the public could be best supplied ; how many cars were wanted each hour of the day, each day in the week, when the Crystal Palace was open ; and, generally, on what occasions when open. A study of this enterprise would lead to rational results as to the need of others, and the study of them in connection would show their mutual influence. What is now left to the "rule of thumb" would then be arranged by the judgment, and the evils which are now left to accumulate until they grow so far as to require abatement as nuisances, would be guarded against, and life would flow more smoothly. Then we would not see so many groups on the corners of the Sixth Avenue waiting for cars only to see them pass filled to overflowing, and forced to walk two miles or lose the sight of the Exhibition.

INDUSTRIAL EXHIBITIONS OF EUROPE.

When visiting the Exhibitions of Industry in Europe, some twenty years ago, I was much struck with the great difference between the products exhibited and those which our Fairs presented. The articles turned upon the luxuries of life chiefly, which, to be sure, were displayed in forms and qualities realizing the highest ideas of the beautiful. Since then, what a breaking out of the workshops and man-

ufactories has taken place! The very catalogues of the London and Paris Exhibitions startle one. The spaces covered seemed almost fabulous, and the demand for more—an absurd craving. The condition of opinion among manufacturers and mechanics now-a-days and twenty years ago must be as different as that in regard to national communications. Then, the traveller went to Liverpool and Manchester to pass between them on the only passenger railway in Great Britain. Now, the post-horse system is almost obsolete, and the steam-horse carries the traveller over the whole kingdom. Then Edinburgh was fifty hours from London, now it is hardly eleven. On the continent the only railroads were in Belgium, except a few miles from Leipsic towards Meissen. Then Vienna was two weeks from Paris, and now it is hardly more than two days. Then the workshops were almost inaccessible, as a rule, and the processes kept secret, but now they seek publicity both in their processes and products. While, in some parts of the Continent of Europe, things have been, in a great degree, stationary, within the last twenty years; in others, railroads and telegraphs have worked wonders. The establishment of the German Customs League (the Zoll Verein) has led to virtual free trade over a large portion of the Continent. The post-coach and diligence are now institutions of by-roads, or are decaying under stable-sheds or antiquated carriage-houses, and the spirit which has animated America and England, has spread to parts of the Continent. In the capital of France, wonders have been achieved. The Faubourg St. Antoine—that hotbed of crime, misery, and insurrection, and the terror of the peaceful quarters of Paris—has been rooted out. Houses lining a splendid street—brilliant with

lights, and beautiful with shops—take the place of those squalid dwellings of wretchedness and crime—the street stretching from the fountains and obelisk of the Place de la Concorde, to the spot where the Column of July marks the site of the old Bastile. Beautiful bridges of stone and iron span the Seine—huge airy markets of iron and glass take the place of the dingy structures of old times—factories spread everywhere in constantly-increasing numbers, and everything betokens wealth and prosperity. True, the flowers grow on the crust of a volcano, but still they blossom, bloom, and shed their seed, replant themselves and multiply, not heeding the coming eruption.

BABBAGE'S LIGHT-HOUSE SYSTEM.

One of the most brilliant results of that World's Fair at London, was a book upon it by Charles Babbage, well known to Americans who have traveled, from his steady kindness, cordial hospitality, and hearty attention—well known to ALL, traveled or not, for his calculating engines and the wondrous resources of mechanical and mathematical genius which brought them forth. The finest principles of administration are there laid down which I have seen embodied in language. Such principles as the administrative labors of Alexander Hamilton and Albert Gallatin (and I might add names of men yet living) would have served to illustrate, or as might have been obtained by induction from them. The principles which should regulate such exhibitions as that of the World's Fair are elaborated in the most forcible manner.

Among the chapters of that work is one devoted to Light-houses and their improvement, and containing the general principles and many details of a most admirable system for distinguishing lights, by causing them to show their numbers by rapid eclipses and flashes of light. Any digit may be expressed by an equivalent number of occultations and restorations of the light: thus, one eclipse and one restoration would stand for the number one. The value of the digit, whether belonging to the units, tens, or hundreds' place, might be indicated by occultations preceded by shorter or longer intervals of light, as three occultations at intervals of a second would express three units, then a pause of several, say three seconds, then five occultations would express five in the ten's place, then a pause of say three seconds, and two occultations would express the hundreds, then a longer pause of say ten seconds, would show that the number was complete. Thus, the number of a light-house might be repeated more than once in a minute, even where the figures are quite high, and each light-house would continue the repetition of its own number. Such lights can be seen at least as far as others which are not temporarily obscured; and by arranging the numbers of the light-houses along a coast, upon such a system that the adjacent lights shall have very different numbers, the figures representing units, tens, and hundreds of the number not recurring in the adjacent lights, the distinctions can practically be made very complete. For the world-wide purpose of its inventor, but three digits are required.

The mariner who approaches Sandy Hook, for example, would see constantly repeated number *one*, a flash for a second, darkness for three. Let his pulse beat ever so irregularly from toil and anxiety, he could discern by it infallibly, that the dark interval was three, the light, *one*—and thus that this was the cynosure to lead him to the haven where he would be. Nor could he mistake Fire Island Light for Sandy Hook—for it would signal twenty-two, first two, next two—but never *one*.

Honor to the genius of this great inventor and philanthropist! How happy would we have been to welcome him amongst us, to put the seal of his fame upon the details of the light-house system. We envy not to Europe the possession of such ability, but rather would seek to give it world-wide usefulness. Nor is this mere vain-glorious boasting, for the Executive Board under which the Light-house system is now placed, and at the head of which is the Secretary of the Treasury, invited Mr. Babbage here that he might mature and practically apply his great designs.

Here memory brings back upon me a bright but mournful recollection. Indulge me, that I cannot pass it by. Known to many in this community as a writer of pure and elevated mind, as a lecturer on themes of English poetry and history, as the devoted friend and admirer of Wadsworth, and perhaps his most successful delineator, he is not so generally known as having had full and glorious sympathies with science and with scientific men. Henry Reed had a

mind and a head capable of embracing both, and if he loved literature more, he did not appreciate science less. He it was who, in conjunction with a young and zealous astronomer, (Dr. Gould,) almost shook the determination of Babbage to avoid or to defer visiting us. The melancholy loss of the accomplished envoy in the "Arctic," was a reason the more for the philosopher's decision not to cross the Atlantic.

SYDENHAM PALACE.

The removal of the great London Crystal Palace to Sydenham, and its conversion into a receptacle for the permanent exhibition of the arts and sciences, constituted an epoch in our century. Here, upon an elevation overlooking the fertile plains of Kent, this palace of knowledge was permanently reared and dedicated to progress. Its grounds reckoned in acres, their slopes and terraces laid out with consummate skill in beautiful forms and in the contrasts of the gardens of Italy, France, and Britain, in the utilitarian representations of mines and of their working, and in the wonders of the earth, and of the great deep, in epochs antecedent to the creation of man. Its interior in ample development shows the physical geography of the globe: America, with her mighty lakes and rivers, her varied vegetable and animal life. The plains of the African desert are found in place, and the bear, and tiger, and giraffe occupy their characteristic haunts. The Chinese and Persian marts are displayed to the admiring gaze. Europe, in its Alpine grandeur and its English beauty—Europe, in its

arms and its arts. The visitor dwells for a moment in a hall of Egypt, surrounded by those sphynxes whose very expression excites such strange emotions in the soul—by those Caryatides, who bear so wearily the massive architecture of the solemn temple. The light Grecian fane, with its gilded magnificence within, and its wealth of beauty in marble within and without;—the Roman temple and the Roman dwelling—the Pompeiian house, recreated as by the touch of Bulwer's magic wand, its domestic life and its hospitality are there. The Alhambra is reproduced, with its Court of Lions; the gorgeous mediæval cathedral of the Continent is there, with its luxury of carving, and stained glass, and pictures, and relics. The English cathedral, with its tombs of warriors and ladies, statesmen and churchmen; the old English house, with its rush-strewed floor, and its dais and ample board above and below the salt, for gentle and for simple; the collections of modern comfort and luxury—of glass, china, carpets, tiling, carriages, of machinery, always in motion, and weaving the most delicate as well as the commonest of fabrics. One passes visibly in a day through all the progress of the world in its centuries, acquiring, through sight, definite and all-enduring ideas of times past, and their order and succession. Enclosed under acres of glass roof, whose iron girders, colored by the hand of Owen James, seem like a fairy network against the sky, this building itself, one of the wonders of the world, gives the last, greatest idea of all—that, in this present time and place, such a wonder could be realized.

AMERICAN EXHIBITIONS.

What if the Mechanics of America of fifty years ago could awake to visit the halls of our Crystal Palace! How would Robert Fulton, and John and Robert L. Stevens glow with enthusiasm as they saw those steam engines moving so noiselessly in their power, any one of which would have ensured the success of their early experiments. Oliver Evans would see that his ideas of the locomotive have been more than realized; while a simplicity in mechanism, for which he ardently panted, had been fully attained. Rumsey and Fitch would see that the seed which they had planted was not wasted, but had yielded many hundred fold.

It is certain from the repeated results of the Fairs at Boston, New-York, Philadelphia, and Baltimore, that these exhibitions have been productive of good to the arts. Competition is developed in its most profitable forms. Secresy, the bane of mechanical improvement, becomes impossible. No great or marked advance in an art can escape recognition, though doubtful cases may be decided erroneously. In the award of distinction the liberal policy is the wise one, and this has generally been followed by all these institutions.

FRANKLIN INSTITUTE.

The Franklin Institute has undertaken something for the progress of science, believing that the arts owe to science a debt over and above those which she has derived from

them. This is a debtor and creditor account which it would be difficult to adjust, even by the aid of an accountant and a master in chancery. Physical science would not have reached its present position without the facts which the arts furnish to build upon. On the contrary, how many applications flow from one scientific principle? How complex the action and reaction of fact and principle, of art and science! The investigations by a committee of the Franklin Institute, of *water* as a moving power, have been pronounced by the highest living authority models of their kind. Those relating to the explosions of steam boilers actually so far exhausted the subject, that no considerable additions have been made to our knowledge in regard to it for the last twenty years, and public information is not even now up to the level of the results then deduced. The production within a boiler of hydrogen gas, and its subsequent mysterious explosion, still finds its way into print, while the dogma that a steady increase of steam pressure cannot produce violent explosions, has yet its advocates. But, in general, these things are now better understood; and the searing iron has been so effectively applied by this Hercules to many of the heads of the hydra ignorance, that they have not again sprouted.

The hot and unsaturated steam within a boiler not properly supplied with water, is no longer believed to be the cause why, when water is injected suddenly, the boiler explodes; and on the contrary, the heated metal is now known to be the source of danger—danger from its own weakness—danger from the strength of steam which it suddenly supplies.

In taking up the subject of Weights and Measures, the Franklin Institute did a good service to the State. Happy if it had enforced further attention on the public to the great reform needed.

The promotion of the increase of knowledge is one of the highest functions of such an Institute. To it the Franklin Institute has added the publication of a Journal by which to diffuse knowledge, a publication sustained now so long, that we have a right to consider it as one of the established works of our time, a permanent mark of the usefulness of mechanic associations.

How eminently these things contributed to the mutual improvement of the members who earnestly engaged in this work,—the work thus twice blessing, the giver and the receiver! How it served to develop the power of those men of strong minds and willing heads and hearts!

Shadows gather around me as I speak—the mechanics of Philadelphia of thirty years ago, those then in their prime, now grey—the seniors gone to their rest. Worthy successors of Evans and Perkins, and Lyon and Ramage. Ronaldson and Lukens, Reeves and Tyler, and Patterson, worthy to be the scientific teacher of such men. Cautious but generous Ronaldson, always laboring in the cause of humanity and progress; skillful and ingenious Lukens; acute and laborious Reeves, equally able in devising experiments and mechanism, and in using them; philosophic Tyler hammering out iron heated by a fire of iron fuel to prove a principle, and puzzling the scholastics with the theory of the top.

I am not aware that other institutions have followed in the wake of the Franklin Institute, nor does that institution appear to have found it expedient or necessary to continue in this course. The men who at one period could devote much time to such researches, are now so greatly in demand that they cannot give their time to this good work. What if any one should have whispered, while thus employed for the public good *gratuitously*—they were laying up for themselves, for the future, a store of good things! Young men, be not too careful to see an immediate return for your exertions. Be not too careful to pursue a selfish end by selfish means. Give way to the generous impulses of your heart, and labor in love!

Do such institutions as these form any part of a University of the Arts?

GOVERNMENT WORKS.

I have not time to notice here the doings of our government directly or indirectly, in aid of Science, the Coast Survey, the Patent Office, the Nautical Almanac, the National Observatory, the Ordnance and Engineer departments, the Surgeon General's department, the Topographical Bureau, the recent expeditions of Perry, Page, Ringgold, Rogers, and Berryman, nor the institution founded by the munificence of Smithson, nor those Arctic expeditions, chiefly set afloat by a generous-hearted, progress-loving merchant of New-York. All these bring, in their place and degree, renown to the country. I have sometimes thought that if they could be directed by an

Academy of Sciences, so as to prevent occasional misdirection and jostling, they would contribute better to the great end which all have in view; but perhaps independent action and rivalry are, after all, the best for them, since the tendency of government works is usually towards inactivity. Indirectly connected as they now are with the science of the country, a wholesome stimulus is found in scientific opinion. That this is exercised leniently, even to a fault, must be admitted; and our men of science are awakening to this conclusion and to a knowledge of the mischief which it has done to the progress of true science in the United States. Generosity is the right side to err upon, but it may be carried too far.

FREE PASSAGES FROM EUROPE.

At a recent meeting of the American Association for the Advancement of Science, free passages from Europe, and return passages to Europe, were freely offered by the Collins, the Cunard, the Belgian, Glasgow, and Bremen steam-ship lines, for such distinguished foreigners as might be invited by the Association to attend their meeting; and the additional passages offered by the owners of the lines of sailing packets were so numerous, that it might be well said there was no limit to the hospitality which, through their intervention, might be extended to the *Savans* of the old world! How admirably such deeds illustrate the character of our merchant princes, and how they speak to the old world of the warm-hearted liberality and regard for learning in the new! On the circular of the American Institute are the names of thirty railroads and steam navigation companies which have patronized

this exhibition of the arts, by undertaking to pass goods intended for it over their roads at half freight. Nor is this liberality confined to the State of New-York, but extends through nearly all New-England! The liberal soul deviseth liberal things, and commerce and the arts tend to liberalize the mind.

COMMERCIAL ASSOCIATIONS.

While the mechanics and manufacturers have found rallying points in the American and Mechanics' Institute, the merchants have made their organization felt for the advancement of the great and general interests of commerce, through the Chamber of Commerce.

The want which it represents is—united effort in movement upon objects affecting the interests of commerce and navigation. It is a peculiarity of these associations that they have no costly buildings appropriated to their action. This is emphatically true of the Chamber of Commerce, which assembles in various places, and at somewhat irregular times; truly utilitarian in this respect, that it comes together whenever there is something to be done, and depends upon the wisdom of its council rather than the sanctity of the place from whence it may emanate.

The union of views of practical usefulness, and an enlarged spirit of inquiry, characterized the proceedings of the Chamber of Commerce of the State of New-York from its earliest organization, in 1768.

Questions in regard to currency and the value of gold and silver coins claimed its attention as early as 1769,

and in the minutes of proceedings for November of that year, is recorded the reply of the astronomer, Rittenhouse, and John Montresor, to the request of President Cruger for a determination of the latitude of the Battery.

This eminent body seems to have wielded almost legislative influence in moulding the commercial character of the past generation. In 1786, scarcely more than two years after the evacuation of this city by the British forces, the Chamber expressed its high idea of the proposal of one of its members for connecting the city with the great Lakes by a line of water navigation—concluding with the statement, that as a single corporation, its funds, of course, were not adequate to the undertaking! Can we wonder that from such beginnings, and with such lineage as that traceable in its subsequent history, the enterprise of this metropolis should reach to such a Himalayan height?

Previous to 1806, action had been taken in the Chamber, on three several occasions, for regulating the system of pilotage, and measures were instituted to remedy the complaints to which the system then in use had given rise. Quarantine laws, which had some years before been discussed, in 1822 again became a subject of deliberation, with other matters not less vital to the public interests.

In 1828 the Chamber responded favorably to a request from the Philadelphia Chamber of Commerce, for its co-operation in inducing Congress to construct the Delaware Breakwater.

After repeated action on the subject of pilotage, the Chamber, in 1837, represented the grievances arising therefrom, by a committee sent to Albany for that purpose.

Questions concerning wharfage claimed the attention of that body in 1840, and its committee then made the important suggestion that the piers and wharves of the city should be subjected, if practicable, to a uniform system of rules and regulations. What difficulties and dangers to the commercial interests of the city might have been avoided, had this suggestion been adopted at that day?

ASTRONOMICAL OBSERVATORY.

Favorable consideration was given in 1845 to a proposal from Columbia College for the establishment of an Observatory near this city, the Chairman of the Committee to whom the matter was referred, reporting it: "as an object well worthy of the consideration of the Chamber, alike for its utility to the commercial interests of the city, and for the maintainance of its character as an advocate for the cause of science."

It is interesting to observe how public opinion grows by action from one individual, or one locality upon another. The project of an Observatory has been dwelt upon, explained and enforced, until many minds are imbued with it; and the question is not—should there be an Observatory—but rather *where*, and on what scale shall the most efficient one be established. From one small beginning at Philadelphia, this fire has spread to Cincinnati, Washington, Cambridge, and Tuscaloosa. Beams more or less bright, seem

to flow from the capital of your own State, aurora-like, high towards the empyrean. A devoted wife has given the name of her husband to immortality, while the sun and moon shall endure! The Dudley Observatory wants but moderate aid to place itself in the front rank of such establishments, to enable it to fulfil its duties to science and to society, the first by the study of the stars, the second by furnishing time to commerce and navigation—time to travel, time to society. Accurate time to the navigator is an essential,—accurate time to the railroad traveller is his life—accurate time to the man of business is money. How pleasant to pass down Broadway and find ten minutes difference of longitude, equivalent to two degrees and a half, or some hundred and seventy miles between Union Square and Wall-street, with half of it between the City Hall and Trinity Church! Time signals by telegraph and clocks, regulated by electrical currents controlled at the Observatory, will put a period to all these irregularities. They deserve encouragement as life-saving, time-saving, and money-saving inventions.

A memorial was adopted in 1851, for co-operating with the citizens of North Carolina, in efforts for opening a good inlet into Albermarle Sound; and the scope and spirit of the Chamber are well illustrated in its stating, as the ground of interposition on that occasion, “that the work proposed is one calculated to benefit the commerce and shipping interests of the whole country, and thus is a national object.”

HARBOR ENCROACHMENTS.

In the very same year, well-conceived measures were taken by the body, to stay the encroachments on the channels of the East and North Rivers, and in the following year the Chamber warmly seconded the recommendation for a permanent Light-House Board.

The process by which in all our cities we go on increasing the land area, by diminishing that of the water, is worthy of more than a passing examination. To obtain deep water, we extend from the natural bank a pier or wharf, until it reaches the required depth. The current which once passed by the bank, now passes by the end of the pier, and gradually the space between the bank and the pier is filled up with silt and mud, there being no longer a current to keep the material suspended, or to carry it onward. Soon the line of shoal water is pushed out, until it is nearly as far beyond the end of the wharf, as it was formerly from the bank. The pier is again built out, the shoal goes on in advance, and thus there is a struggle between art, directed by injudicious means, and the powers of nature, which can have but one result. Two such piers inclose a space which, by becoming shoal, is no longer useful as water, but being filled up becomes valuable as land. Meanwhile the East River is diminished to two-thirds of its original width, and but for the timely interference of the State Legislature, prompted by public opinion, the commercial prosperity of the city might have been seriously affected.

As it is, the danger of the removal of the great marts of commerce to neighboring localities in or out of the State, does not seem to be sufficiently appreciated. Diminish the facilities for commerce here, and it will infallibly seek them elsewhere.

The great advantages of docks and warehouses have been frequently pointed out, and yet the recommendations of the State Commissioners on harbor encroachments, and their advisory scientific counsel, are thus far unheeded, and property owners are determined to interfere by filling up instead of by excavating, by piers and wharves instead of by docks and basins, by stores in streets, instead of warehouses on piers. This must drive the dock system to Brooklyn, to Gowanus bay, to Hoboken, and to Jersey City, if the same spirit does not also fill the water spaces there, and carry the docks down to the flats below Jersey City, making in the future new cities arise better adapted in their arrangements to the wants of the commerce of the times. The laws on this subject are as inflexible as any other natural laws. You may as soon expect, like the French politician, to withdraw your balloon from the action of gravitation as to evade those laws.

Manhattan Island was intended by nature as the site of a great commercial city. The channel of the Hudson, directed from the New-Jersey shore and towards that of New-York, makes the great city front. Turn it to the New-Jersey shore, and commerce will be turned with it. Aid nature by multiplying facilities here, and commerce will take a long lease of your piers, and basins, and warehouses.

While these subjects interest the whole community, they have formed the special study of but a few. It is our characteristic to let an evil grow until it becomes intolerable, and then to act. The present Board of Commissioners on Harbor Encroachments have found difficulties at every step, growing out of the late day at which the movement resulting in their appointment was made. Thirty years ago it would have been easy to have fixed a proper pier line for New-York, but public opinion was not alive to its necessity. Let us at least be wise for the future, and insist that there shall be special persons to keep these things in view, and to enlighten the public mind; to suggest public action in regard to them, and to restrain individual cupidity when it would interfere with the general welfare. There is no other safety for the future of the metropolis. Private interest surely cannot prevail in shaking off the wholesome restraint of a commission whose only interest is the public good.

NEW-YORK HARBOR.

What a scene of beauty New-York harbor presents on a sunny morning of the Indian summer, when the purple colored haze hangs over the water and land, lending to the landscape those beautiful tints for which the Bay of Naples is so famous. There is hardly a breath of wind, and the sluggish sail scarce gives impulse to the vessel. What forms of beauty those innumerable floating objects present, the dark hulls and white sails contrasting strongly through the gorgeous air tint which covers both. They seem less the instruments of commerce than the creations of fairy

land. In the midst covering the water with purple foam are those giants in strength, with the bodies of pigmies, the tow boats, moving with impatient snortings like Neptune's sea horses, and carrying by their power immense forms with masts, and spars, and rigging, looming in huge, uncertainly high through the misty glow of this quiet, breezeless, rosèate air. It seems almost a pity to destroy so beautiful a scene by the utilitarian appliances of commerce; but the mariner frets as the sails flap, and invokes the aid of steam to take him from the enchanted port—the sea-breeze rises, the sunlight glows, the illusion vanishes, the ships move, and the beautiful passes into the useful.

WEIGHTS AND MEASURES.

At a recent meeting the Chamber of Commerce has taken up the subject of Weights and Measures. As this important matter, striking deep into the interest of society, is now agitated both in the Chamber of Commerce and in the Geographical Society of this city, I would observe, that a great and simple reform would be to insist upon *one weight and one measure*—to adopt one unit of weight, one unit of length measure, and one unit of capacity measure, for both liquid and dry measures. There can be but little doubt that some day that there will be a nearly universal system of weights, measures, and coins in use. The world will not bear the useless labor and waste of time caused by the present diversities, and as communication grows more easy, this burthen will become intolerable. Sinbad, the Sailor, will not continue to carry this old man of the land upon his shoulders.

In view of this, if it is desirable to postpone any radical changes, the least that should be done is to reform our weights and measures, so that we shall use only one unit of weight, the troy or avoirdupois pound; one unit of length measure the yard or foot; one unit of capacity measure, the gallon or bushel, and that these shall be decimally divided.

The United States Government has, with a view to produce practical uniformity, distributed to all the States actual standards of weights and measures, and has multiplied them by sending also to the Custom Houses. These, by legislation in most of the States, (twenty-five out of the thirty-one) are adopted as the only lawful standards of weights and measures.

AN AMERICAN UNIVERSITY.

We have now looked into the little nook of our exhibition, throwing a more or less distinct light upon the products, trying to show the outlines of the schools, academies, and colleges, and the faint shadows of the Universities, using as many gas burners as our supply would permit, in considering the institutions for improvement of mechanics, and the mechanic arts, and for progress in science, in commerce, and in the arts. It is not an exhibition of "all institutions," so we will be pardoned that so few are represented, and that we have taken them rather as they came to us, than as if we had sought them, and asked them to send their products for exhibition. That we have taken those nearest home, rather than sought far and

wide for more appropriate materials—that we have stuck upon the minor pegs our notice of Europe as it was and is, and a leaf from the volume of its industrial and mechanical development, and from the history of our own progress in the arts and sciences. In a side nook is a favorite collection of models and drawings, representing in fragments and in coarse outline, a much needed institution still uncreated, to be based upon the schools, colleges, and the Mechanics' Institutes—to be built by the exertions of mechanics, of the merchants and the scholars—an institution for the more effective promotion of knowledge among its members, for the advancement of the branches of knowledge themselves,—in the most comprehensive sense of the words—a University of the Arts and Sciences.

If language was taught upon the natural philosophic principles so ably and plainly laid down by Professor Roemer, there would be no difficulty in recognizing it as a science, and no violence would be done in thus classing it. “We should proceed from facts to principles, and then from principles down to consequences; we should begin with analysis and end with synthesis.” Is not this science? The sentence is from Professor Roemer's Essay on the Study of Languages.

ORIGIN OF UNIVERSITIES.

The Universities of the Old World, if they did not spring chiefly from the wants of the professions, at least in their systematic organization had direct reference to

the technical preparation for one or more, or all of them. Universities are traced by some historical writers back to the time of the Roman Empire, and by others to the schools of the Arabians. The fact is, professional education in theology, jurisprudence and medicine, and sometimes astronomy or astrology, as it was in those days, was engrafted upon various stems constituting the institutions which, in the middle ages, most resembled the modern Universities. Before the invention of printing, oral instruction was of course of greater relative consequence than after, and the University of Bologna numbered ten thousand pupils. After the invention of printing, (says Libri,) the professors had fewer attendants upon their lectures, but their instruction reached further. As extremes meet, events moving in a circle, so in those times as in those latter days, travelling was a great source of information, but the distances we should count as but travel about one's room. The same professors were employed in several institutions lecturing as itinerants, which we now deem a practicable feature for modern improvement, the scale of distance being, however, vastly enlarged. A professor's certificate of study occupied the position of the more modern degree, which dates only from the twelfth century. Instruction was, in the Italian Universities, gratuitous from the thirteenth century. The democratic element (using the words in their largest acceptation) was strong in these institutions, for one of the luminaries in the Paris University was the son of a washerwoman. The privileges of Professors and Students, their exemption from arbitrary rule and from party changes, united in one brotherhood the friends of knowledge and of liberty.

LEYDEN.

In Holland the Prince of Orange, as a reward to the citizens of Leyden for the bravery which they displayed during the siege of the town by the Spaniards in 1773-74, gave them the choice of exemption from certain taxes, or a University. To their credit they chose the latter, setting at that early day the example (if a penny saved is a penny earned) of encountering taxation for a public education. The reputation of this establishment was at one time so high, that it was called the "Athens of the West." The great physicist, Des Cartes, and the critic, Scaliger, the jurist, Grotius, and the physician, Boerhaave, were among the professors and scholars; and Goldsmith and Evelyn, and other distinguished Englishmen studied there. It is divided into four Departments: Law, Theology, Medicine, and Philosophy, and has twenty Professors. It is an example of a University without buildings except for Museums and Lecture Rooms, its Professors living in private houses, and its Students in lodgings. It has an observatory, an anatomical theatre, and a museum, a botanic garden, a chemical laboratory, and a natural history museum, founded on the basis of the products of Japan.

UNITED STATES.

Many distinct movements have been made in various parts of the United States towards the establishment of an American University. I will not pretend to enumerate

them. While there is, of course, considerable diversity of opinion as to what such an institution should be,—whether the National Government should be invoked, the State Government, or private munificence, or whether it should be self-supporting—and endless modifications of these; the want is admitted, of an institution, supplementary to our colleges, where young men can be carried onward beyond a college course in literature and science, where our young merchants, and mechanics, and teachers may find incentives and means of progress—a great University of the arts and sciences, in which the practical man may meet on equal terms with the scholar. Whether it shall give professional education like the institutions of the same name in the old world is a matter not organic; the great field must be, that unoccupied by our colleges, and it must be tilled to suit American soil and climate. The circumstances of society here are peculiar, and the organization must be adapted to them. The object is not to supersede existing institutions, but to establish one supplementary to them. The number of young men now sent abroad to attend courses of chemistry, mineralogy and geology, mining and metallurgy, to study civil engineering, to perfect their knowledge of ancient and modern languages, would of themselves make a respectable number of pupils for a University.

In the words of a distinguished man of science who has devoted much thought to this subject, “The best plan for founding a University is that which concentrates the interests of the largest community, and combines the greatest variety of intellect, with the smallest pecuniary

outlay and the least provocation of opposition. The most feasible plan is that which is most elastic, and which may be the smallest in its germ, while it is most comprehensive in its full development. Its professors must be the ablest men in their respective departments; it must be connected with a fine library, a well equipped observatory, and complete collections and laboratories for the elucidation, illustration and investigation of every species of knowledge. But it is expedient that the library, the observatory, the cabinets, and the laboratories should be under the especial control and fostering care of their respective boards of administration, whose local residence and peculiar habits of mind should adapt them to these duties. The general board of overseers should unite all that is necessary to command the universal confidence of the country, and their principal duty should be to secure, by consultation with the professors, the ablest body of officers."

The development of this scheme contains as a cardinal principle the establishment of Professorships or Lectureships, the remuneration for each of which shall not exceed one thousand dollars a year, so that an income of forty thousand dollars would secure forty courses of lectures, several by the same Professor, or all by different ones, as might be determined upon. These Professorships to be vacated every five years, and to require no residence at the University, unless where the same Professor is called upon for several courses, in which case he would constitute one of the governing heads of the University. Each Professor to be required to deliver a course of at least twelve lectures

during the year. The foundation of such Professorships (to take the name of the founders,) would be within the reach of moderate means. The Professors in the various colleges of the country would lecture in the University, deriving additional income by so doing, and improvement from association with their colleagues of the University. The institution can be organized step by step as Professorships are established, and be developed in the direction found by experiment to be most advantageous.

It may be supposed that these Professorships are analogous to the fellowships in the Universities of England ; but this is hardly so. The Professors will be lecturers to diffuse the sciences which they cultivate, bound to certain duties of instruction, and not enjoying that literary ease without much stimulus, which the fellowship procures. If they give several courses, their time may be too much engrossed by active duties, and the other horn of the dilemma be the one upon which they will be impaled. Both are easily avoided. They *must* have time to cultivate science, for the University should hold this to be one of its cardinal objects.

Referring to the union of the practical man and theoretical man in this University of the Arts, I beg to be allowed a remark. Few terms have been more abused than this one of a *practical man*. It is often used to denote one who works by empirical processes instead of by scientific. Empiricism is the lowest form of knowledge. Science generalizes, and the scientific mechanic, instead of looking for separate solutions for every problem,

solves many from one principle. The one gropes as in the dark, the other advances boldly as in the light. Superficial theory runs into quackery, and is deserving of all contempt, but the deeper the study the more practical it becomes. When theory is complete it is always practical; and when it seems not so to be, the absence of this turn may be traced to some defect in the theory. It is easier to work down than up; first to know what the generalizations of ages have done for us—then to improve upon them if we can. The applications of such principles are far easier than their elaboration. The highest principles of science, such as were elaborated by Oersted, and Ampère, and Henry, and Gauss, were required for the application of galvanic electricity to the art of telegraphing. With these are associated the highest grades of mechanism, such as the inventions of House and Farmar. The calculating and printing machines of Babbage are at once an illustration of the union of the two highest theoretical and practical powers. The attempt to sever science and art is mischievous, and in this our time and country will prove abortive. Each is essential to the life and activity of the other.

In organizing such a University, we must consider first the branches of knowledge which should be taught, secure the men available for them, and then make a classification of the whole scheme according to a scientific principle. We might first draw up a project in which all the branches desirable were interwoven, next consider what men we have to fill the chairs, and how the branches must be divided among them. These two considerations would act and react upon each other as far as a practicable scheme was con-

cerned, and the distribution of the subjects would, after they were determined upon, be an easy task. Consulting a number of scientific friends, I find that courses of literature, science, and arts, could easily be extended to sixty in number without assigning any unimportant subject. That these might occupy twenty to forty lectures, and that the least beginning of a respectable sort would be by twenty subjects and ten or fifteen instructors. All the details, however, would be much better left to the organization of the Chancellor and first faculty. After a careful examination of the schools of Europe, some twenty years ago, I saw abundant reason to conclude that an institution might have ever so good a plan upon paper and yet not be successful, and that a moderately good plan well administered might be better than an excellent one carried out by inferior ability. I would therefore counsel as high a flight as possible in looking for the Professors, especially the first professors of the institution, and a liberal concession to their views in organizing and developing the new-born establishment.

With the facilities for travel in our country, the professors of our Colleges could readily take part in University instruction without impairing their usefulness at home. Agassiz lectured in Harvard and in the medical college of Charleston. The most active minds in the Faculties would thus be brought together in one institution, and they would return to their regular posts with all the glow which inter-communication of rich minds is sure to produce to react upon the college and themselves. Thus the requisite number of lecturers could readily be found, and thus the *élite* of our schoolmen and men of science could be brought into regular communication with each other.

The first principle in the selection of the Professors should be that they were capable of advancing the boundaries of their sciences, and not only capable but diligent in so doing up to the limits of their capacities.

It is no doubt true, that many profound thinkers are our good teachers; but where they are, there is a living spirit imparted by their teaching, which penetrates the mind of the neophyte and kindles the flame upon the altar of truth within. It is the highest kind of teaching. A Chancellor of the University who knew how to use men and their gifts, would easily so arrange matters, that by supplementary Professors or by assistants any defect in the teaching of the chief Professor would be made good. In fact, so fairly do scientific men, as a rule, estimate each other, that volunteers would readily be found to serve under the leading spirits in research, to spare their time and exertion, and to occupy the rostrum in their behalf. This is not Utopian.

AWARD OF SCIENTIFIC REPUTATION.

I have often of late years been brought into contact with two different classes of minds, the one which, seeing the brotherly affection of many scientific men for each other, feels and says that American scientists are members of a mutual admiration society; the other, seeing the occasional earnest differences of opinion rising sometimes into the regions of temper, sneeringly says, How quarrelsome philosophers are! The truth, I suppose, lies between—that the philosophers are men, have the hearts of men to feel and love, and the tempers of men, showing themselves in occa-

sional outbursts of volcanic trap, through the horizontal layers of the quietly deposited sand-stone. In regard to the award of reputation which such men make to each other, it should be considered as final and conclusive. It is founded on knowledge as on a rock. Notoriety among these men does not pass for reputation, for one may be personally known to all the cultivators of science in the country, and yet be rated low in mental power. Those of the same pursuits fathom first and most truly the minds of each other, then those of diverse pursuits, the circle of judgment wave-like decreasing in height and sharpness as it expands. The outer world of intelligence is hardly reached by these waves at all; and as well might the scientific man undertake to award reputation in law learning or acumen to the jurist, or in medical skill and power to the physician, or in mercantile knowledge and judgment to the merchant, as to have his place fixed by these instead of his scientific peers. "*Ne sutor ultra crepidam*"—"I love a quotation which is not hackneyed."

While upon this subject of the award of reputation, I wish to be permitted to say a few words about the carelessness with which American doings are too often treated abroad, chiefly to establish the proposition that in science and literature, as in other things, we should rather seek the judgment of our countrymen than that of foreigners, and that we should endeavor to establish a more wholesome public opinion upon this subject, struggling for an American reputation derived from our peers, as, in Europe, a European reputation is derived. The public generally would be more amused than edified if I went into a chapter of facts within my own knowledge, upon the mode sometimes adopted for

attempting to secure a European reputation. The congratulations upon the receipt of a medal from a foreign potentate—which required an act of Congress to be permitted to accept, and which I know to be due to the amiable character of his representative, through social intercourse had with him—seemed to me like those ironical cheers of hear ! hear ! hear ! by which the English opposition benches greet a minister's speech for the crown.

Few books for the times have been written which gave to their authors greater immediate national reputation than Robert Walsh's Appeal of 1819. It was a warm and glowing appeal from the injustice of Great Britain in reference to America and American institutions. As far as the science of the two countries are concerned, I should say that a different feeling exists now ; that if there are icy remains of a once bad understanding and selfish professional jealousies, they are fast disappearing before the warmth of personal acquaintance, rising even to the genial glow of friendship.

I wish I could so speak for the Continent, and especially for France. Since the wane of that great light of the French Academy, Arago, American scientists have had much to complain of. Since its final earthly eclipse they have more. The official publications of the doings of our real men of science are either overlooked entirely, disregarded, or named to be treated with disrespect. This, too, from those who once professed to be amongst the most devoted of the admirers of Arago, and, under his lead, to cultivate friendships which might almost be termed *sentimental*, with our *savans*. "Write to me," said one of these distinguished men to one

of our friends, "at the equinoxes, and I will answer at the solstices." "I wrote," said the American, "at the equinoxes, *but the solstices* have never come." True, there are cases of exception, which, according to the law maxim, prove the rule. Not to indulge in generalities, I state, after full examination, that the methods recently advanced by Le Verrier, a man who of many, has no need to slight the claims of others, for determining differences of longitude by the telegraph, are but the reproduction of those used in the Coast Survey of the United States for now these eight years—the fruits of the labors and studies of Walker and Loomis, Gould and others. Neither the method of coincidences which he lauds, nor that of signalizing the transits of stars, which he considers of the highest merit, *are new*, but have been practised for years, and have been published over and over in official reports, and in the proceedings of recognized scientific bodies, and constitute in part, what may properly be called the American method of telegraphic longitudes. The Astronomer Royal of Great Britain, in a far different spirit, has given to the automatic register of astronomical observations by the galvanic circuit, the title which generously recognizes our claims, and assigns the origin to the United States—in the title of American method of observation.

A lesser light, too, of the Old World, Wichmann, of Königsberg, has just published an article on the difference of longitude by telegraph, stimulated by that of Le Verrier, and containing an outline of his mode of proceeding, which might almost serve as a history of the olden time method of the coast survey.

Better things than this were to be expected from a German physicist. They, of all Europeans, have, in former days, been sore under the infliction of the egotism or neglect of the French physicists; and I remember well the unction with which the story was told me by one of these men who read all languages, that when Becquerel was reproached with his neglect of German electricians in his work on electricity, he exclaimed, with a nonchalance considered typical of the Academy, "Must one know all languages to write a book?"

MUSEUMS.

Around the American University of Science, Literature, and the Arts, would cluster scientific, historical, and art collections of every sort: Museums, libraries, galleries of the mechanic arts, and of the fine arts. Our museums of Natural History, even though most prized for their scientific value, have grown up under the views which prevailed in past time, and are adapted to a past state of the science. They have been modified and enlarged, it is true, to endeavor to bring them up with the science of the day, but the plan or idea upon which they are based still shows itself. They are collections of specimens showing the diversities and not the analogies of nature. Separate museums of comparative anatomy took their rise from the researches of Cuvier and his followers. So the progress of geology gave rise to museums of fossils. So also the discoveries of Agassiz in embryology will produce museums devoted to this branch. But these are fragmentary establishments. A master of the subject has said: "What we now need is a museum in which the

various relations that link together different groups of animals shall be exhibited at a glance, where the anatomical preparations illustrating their structure shall be placed side by side with perfect specimens showing their external forms; where the remains of extinct forms shall fill the gaps existing between the living, and where specimens of the embryos shall illustrate the succession of changes all these types undergo, and the correspondence between the development and the successive appearance of the representatives of past ages."

If the isolated efforts of those devoted to cultivation of science in our day could be brought into combination, such a museum could readily be produced, and the country in which such is first established will take the lead in the future progress of natural history. What an incentive to American exertion, to lead in such a race! Will not private munificence come forward to render such a thing possible?

Already a beginning has been made at Harvard of a great collection, a fragment of this scheme;—but something much larger in the way of effort is necessary to realize the want of the time.

There exists in the country no extensive museum of materials and products of the arts, and manufactures, and of machines. In Vienna, imperial munificence has endowed such an establishment, and it has been growing from year to year, but is still deficient in the full development of the plan. The Conservatory of Arts and Trades of Paris was an admirable beginning of such a museum. You pass through series of models of machines,

from the merest beginnings to the perfection of the present day,—from the rude pumping engine of Savery to the perfect marine steam engine,—from the egg watch of Nuremberg to the modern chronometer. Our government is doing something towards such a record of daily improvements, by preserving the models of the Patent Office, and the present enlightened Commissioner is using his efforts to give space for their display.

The Franklin Institute had a collection derived from the voluntary contributions of depositors at the annual exhibitions.

A great collection, such as the best minds connected with the arts of our country could organize, should be gathered by a University, and be the means of teaching the youth and improving the mature man in knowledge, of the national progress of the world, and the present condition of its workshops. Taking the exhibition of Sydenham Palace as a basis, we should rear upon it a superstructure adapted to the wants of the United States.

THE COOPER UNION.

The stranger visiting New-York, and admiring its structures raised by public and private munificence for public uses, sees inscribed in bold relief on one of them—*To Arts and Science—Union*. Yes, joined in the designs of the Founder of all art and science, they are not in this earthly temple divided. Without science the arts have flourished as handicrafts; *with* science, they have risen to control powers of the earth and beyond the earth. Tubal Cain,

toiling as he fashioned his copper spear-head in the smithy fire, and Henry Burden, as he lightly touched the spring which furnished steam to mould, and bend, and twist the iron horse-shoe, were types of these two conditions. The printing press of Franklin's time, toilfully bringing out its two hundred and fifty sheets per hour, and the great self-acting presses of 1856, inking and printing, cutting and folding their twenty thousand papers with railroad speed, represent these brought into closer compass of time.

How many facts was it not necessary to have established, compared and reduced to principles, before the steps from one of these conditions to the other could be taken? And is not science the generalization of facts? Many men use science as Moliere's Bourgeois Gentilhomme used prose—without knowing it.

The mechanic of the present day is well idealized in the figure designed by Crawford, and selected by Captain Meigs to adorn the pediment of the National Capitol—not the mere handicraft workman, however skilful, with brawny arms and ready fingers, but the intellectual workman, with broad expanse of forehead, and face lighted with the fire of thought, the intellectual mechanic of the Nineteenth Century.

If, with the princely endowment of the Union of Peter Cooper, separate lectureships upon the plan proposed by Professor Pierce were founded, what a splendid branch of the great Art University would not this constitute! Reserving enough of the forty thousand dollars of income to

meet contingent expenses and to provide for a Chancellor, and perhaps certain resident Professors, there would remain enough to furnish thirty courses of lectures upon as many different branches of science. By giving to one Professor several of these, his whole time might be retained for the Union.

The highest grade of science would thus be brought into the class-rooms of this establishment, the name of which, and the well-known views of its modest founder, point to this arrangement as the one adapted to its organization.

THE ASTOR LIBRARY.

An earlier, yet still recent example of the spirit which satisfies itself with nothing less than views of public usefulness on the amplest scale, is seen in the establishment and endowment of the Astor Library of this city. Perception in regard to public necessity may be said to be intuitive. Mr. Astor seems to have acted upon the promptings of his own mind, in founding the noble institution which so aptly bears his name. "It is," says a writer in the United States Magazine, "a first experiment of throwing open a library in a great city to any one and every one without any formality of admission or any restriction whatever, except as to age." When it is remembered that this is not a mere accumulation of eighty thousand volumes, but so many, most of which have been selected with special reference to the want of which suggested the idea of collecting them, it seems difficult to assign limits to the benefits so conferred upon a practical people. "The first purchase for the libra-

ry," says Dr. Cogswell, the present learned superintendent, "was made March 15th, 1839, and amongst the volumes bought were Brittain's Architectural Antiquities of Great Britain, Young's Recent Discoveries in Hieroglyphic Literature, White's Gradations in Man, and Churchill's Voyages. These were the nucleus of the Astor Library, and may fairly be considered as a type of the whole collection."

The donation in 1853, by William B. Astor, Esq., "for the establishment of a department to be called the Industrial Library," continues the magnificent design. What a splendid collection of books is here at hand for the use of the students and Professors of the University!

UNION OF INSTITUTIONS.

With such institutions as the Cooper Union, and the Astor Library, and the Dudley Observatory, a beginning of the great American University of Arts and Sciences seems already made. The museums of materials, products and machinery, of the arts and manufactures, and of agricultural products and machines, of Natural History in all its branches, and the galleries of art, are yet to be founded and grouped in systematic order around it.

This University, like the genius in the Arabian Nights, released by the fisherman from his confinement in the vase, will, from a shadowy smoke, take substantial form, increasing as the country grows, and filling the measure of its greatness. Unlike the relieved genius, it will be the minister of good, instead of evil, and will have the seal of Solo-

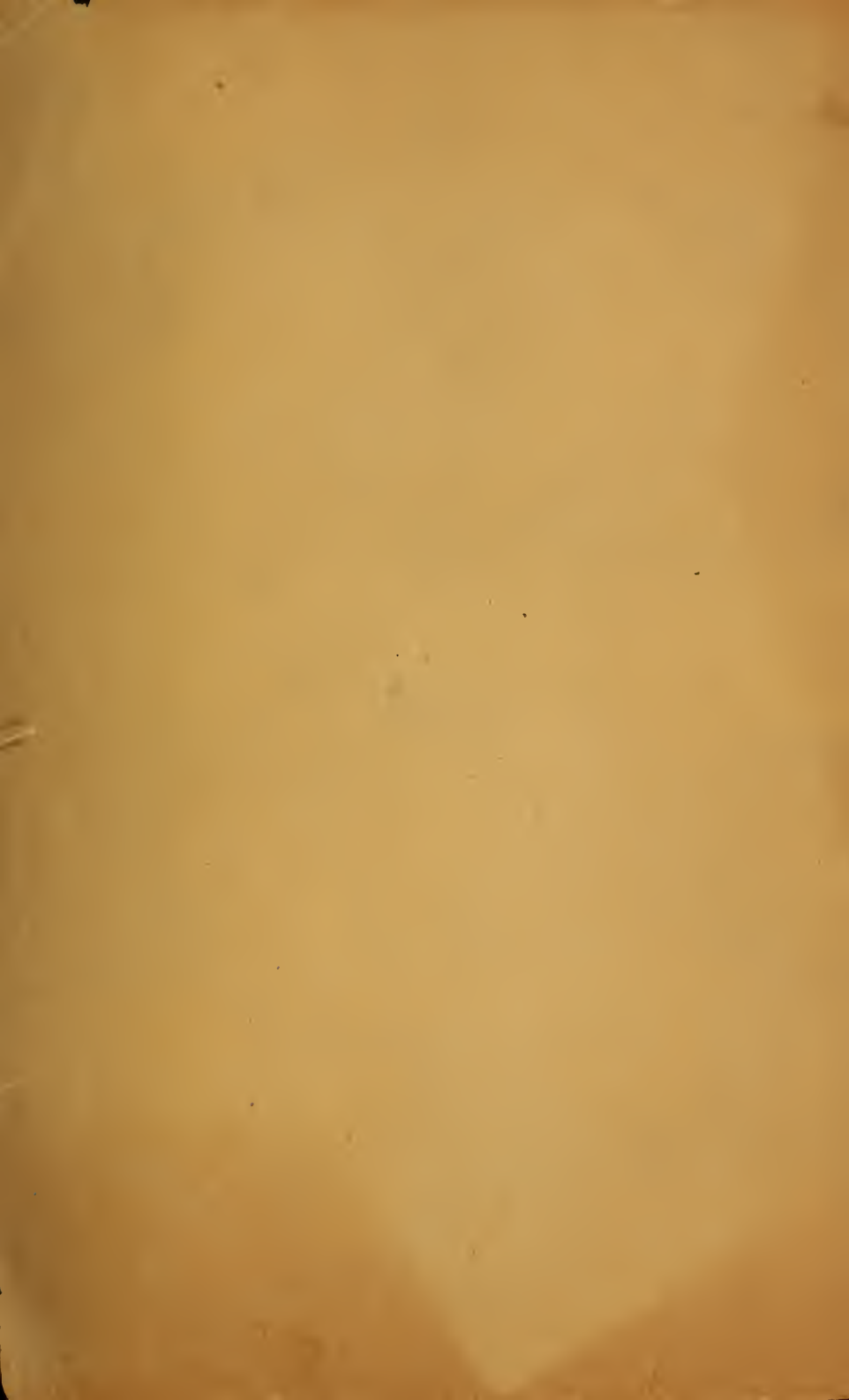
mon set, not upon the case containing its shriveled frame and shrunk members, but to its grand and noble figure and to its towering and magnificent proportions. Under its shade the Arts and Sciences will flourish. In its halls the practical and theoretical will meet in cordial union, while among its Professors and Alumni will be the lights of progress in our country. It will be the intellectual temple over whose front will be inscribed, Dedicated to Science, Literature, and the Arts.

Here, men of progress, scholars, practical men, mechanics, merchants, artists, will meet to study the works of men, and, better still, the works of God—this temple itself but the vestibule of that more glorious structure dedicated to His Word.

Holy men of old studied the works of God, and their glowing references to them fill the pages of Holy Writ. The Psalmist invokes them by name to praise God. Praise him, all ye angels; praise him, all ye hosts; praise him, sun and moon; praise him, all ye stars and light; praise him, all ye heavens, and ye waters that are under the heavens; let them praise the name of the Lord,—for He spake the word and they were made, He commanded and they were created. He made them fast forever and ever; He hath given them a law which shall not be broken.

The spiritual world,—God's hosts, and the material world,—including all space,—creation and law. Sublime conception!

What God hath joined together let no man put asunder.
Let mutual love penetrate the hearts of those who study
the works and the Word of God. By Him they were both
given,—by Him we were made capable of their study.
Both are, in fact, His Works.



LIBRARY OF CONGRESS



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